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Macroprudential policy frameworks, instruments and indicators: a review¹

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¹ This paper was prepared for the meeting. The views expressed are those of the authors and do not necessarily reflect the views of the BIS or the central banks and other institutions represented at the meeting.

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Blaise Gadanecz² and Kaushik Jayaram³

Abstract

This paper reviews the recent literature on various aspects of macroprudential policymaking, covering: the use of indicators to guide such policies; policy tools and implementation; assessment of the effectiveness of the policies. In the light of the Great Financial Crisis, four key lessons emerge. Firstly, there is a clear need to put in place macroprudential frameworks. Secondly, measuring financial instability conditions requires a better understanding of financial cycle dynamics. More work is needed to model the empirical properties of the financial cycle. Capturing the interactions between systemic risk, market dynamics and policy choices, as well as spillovers is an area of policy where theoretical and empirical analysis can be developed further. These features also need to be considered when assessing the costs and benefits of macroprudential measures. Thirdly, macroprudential tools are too focused on banks. Changing patterns of financial intermediation call for greater attention to the actions of nonbank players. Lastly, quantitative models combining micro- and macro-level data are required to analyse and calibrate macroprudential tools deployed, and to gauge their effectiveness.

Keywords: macroprudential policy, financial cycles, measuring systemic risk, micro and macro data

JEL classification: G15, G18, G21, G23, G28

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1. Introduction

A key lesson from the Great Financial Crisis is the need to put in place macroprudential frameworks, a view that the Bank for International Settlements had been advocating for many years (Clement (2010)). Macroprudential policies are a key component of the post-crisis framework for financial stability (Borio (2014a)). The aim of this paper is to review the more recent literature on this subject, particularly the work done at the BIS.

The macroprudential policy framework comprises a broad range of policy instruments supported by appropriate institutional arrangements governing their implementation (IMF (2011)). Macroprudential policies focus on the system as a whole rather than its individual components (Crockett (2000), Borio (2003)). Crucially, the effectiveness of macroprudential policies depends on an ongoing assessment of financial conditions, particularly of the build-up of system-wide risks.

While there is no clear consensus on what is precisely meant by macroprudential policy or how it differs from other prudential policies, it is commonly recognised that its principal purpose is to limit systemic or system-wide financial risk (CGFS (2010, 2012); McDonald (2015)). More specifically, macroprudential policies have two main objectives: to strengthen the resilience of the financial system, and to actively limit the build-up of systemic financial risks. Macroprudential policies focus on the interaction between the financial institutions, markets, infrastructure and the wider economy. For example, one objective of these policies would be to encourage the build-up of countercyclical capital buffers in boom times with a view to strengthen bank's defences against the build-up of system vulnerabilities. These buffers would be used to limit losses incurred by banks or other financial system participants in downturns. Another goal of macroprudential policymaking would be to ensure that large, systemically important institutions are subject to more stringent prudential requirements and supervision than smaller players as the potential failure of such institutions would have serious consequences to the financial system and the economy as a whole.

While macroprudential policies are distinct from day-to-day risk management, many macroprudential tools are in effect microprudential instruments deployed with a systemic perspective in mind (BIS (2010)). Depending on the type of vulnerabilities that need addressing, policy tools can be targeted at banks' capital requirements (countercyclical buffers, dynamic provisions, sectoral capital requirements), their liquidity (countercyclical requirements), or the asset side of their balance sheet (loan-to-value and debt-to-income ratios). Some liquidity-based instruments, such as haircuts and margins, can also be applied to specific markets.

Being preventative in origin, macroprudential policies need to be distinguished from crisis management and resolution policies (IMF (2013)). They are also distinct from capital flow management policies, even though many emerging market economies have resorted to them in the past decade for macroprudential purposes.⁴

⁴ The idea is to avoid the build-up of vulnerabilities arising from large capital inflows: see Bruno, Shim and Shin (2015).

A key difference from other policies (monetary or prudential) is that macroprudential policy is aimed at specific sectors or practices⁵ whereas other policies are typically applied uniformly across the system (Shin (2015)).

This paper takes stock of the recent literature on various aspects of macroprudential policymaking, covering: the use of indicators to guide such policies; policy tools and implementation; assessment of the effectiveness of the policies. The paper is structured as follows. Section 2 discusses the concept of financial cycles and their role in the measurement of systemic risk. Section 3 reviews the types of indicators that can be useful for guiding macroprudential policy intervention, and the desirable properties of such indicators. Section 4 focuses on the choice of macroprudential instruments, based on specific vulnerabilities and policy objectives while section 5 examines the options for the setting and timing of macroprudential policy interventions. Section 6 discusses how macroprudential policy relates to monetary policy. Section 7 offers ways to assess the effectiveness of policy interventions. Section 8 discusses the need for marrying micro- and macro-level data for macroprudential analysis and policymaking. Section 9 concludes.

2. Financial cycles and financial stability

The measurement of financial (in)stability is “fuzzy” at best of times, more so when attempting to measure the build-up of financial risks ex-ante. Nevertheless, this is a key challenge in attempting to model financial instability conditions. Recent studies particularly in the BIS suggest that understanding the characteristics of financial cycles is key to measure the build-up of instability conditions in the financial system. While analytical perspectives differ on whether the conditions are driven by fundamentals or are endogenous to the financial cycles (with added impetus through exogenous shock amplifications), two common approaches can be discerned.⁶ The first one analyses how aggregate risk is endogenous with respect to the collective behaviour of economic agents. The second one dwells on the amplification of risks due to a number of reasons, eg information asymmetry, herding behaviour, leverage, cross-border exposures. More broadly, this approach puts emphasis on the distinction between individual (rational) actions versus collectively desirable (welfare enhancing) actions. Irrespective of the source of conditions that generate instability, policy analysts generally agree on a need for an operational framework that strengthens the robustness of the financial system to shocks. Since such a framework must necessarily be systemic in orientation, identification and monitoring of systemic risks in the financial system is key.

Underlying these perspectives is the growing recognition that a pure business cycle approach to individual economies and the global economy cannot fully account for the interaction of financial variables and output. Financial cycles are seen as a more promising line of enquiry to assessing the interactions and joint fluctuations of

⁵ In some cases, instruments such as LTVs may be used to limit credit surges in property markets. The policy to encourage the build-up of countercyclical capital buffers in systemically important banks would be another example.

⁶ The discussions in this section is mainly based on the work done at the BIS (eg Borio and Drehmann (2009), Drehmann et al (2012), BIS Annual Report (2014)).

a wide set of financial variables including quantities and prices. Credit aggregates encapsulating leverage and asset prices (including importantly property prices) play a significant role in this regard. Mutually reinforcing interaction between financing constraints and perception of value and risks are at source of conditions leading to financial distress.

Research at the BIS suggests four broad features that characterise financial cycles.⁷ First, financial cycles are much longer than business cycles. Therefore a longer-term view is required. Second, peaks in financial cycles coincide with banking crises or serious financial distress. Financial booms with mutually reinforcing rapid credit growth, surging asset prices often coupled with accommodative monetary and financial conditions leave the system vulnerable so that relatively modest shocks to particular sectors are often amplified into system wide shocks. Third, financial cycles are synchronised across economies. Mobile external capital and liquidity conditions tend to amplify movements in credit aggregates within an economy, but monetary conditions also have a strong cross-border spillover effect. Fourth, financial cycles are more useful to detect risks of financial distress with a good lead time. It is possible to measure the build-up of systemic financial risks in real time with a reasonable level of accuracy⁸.

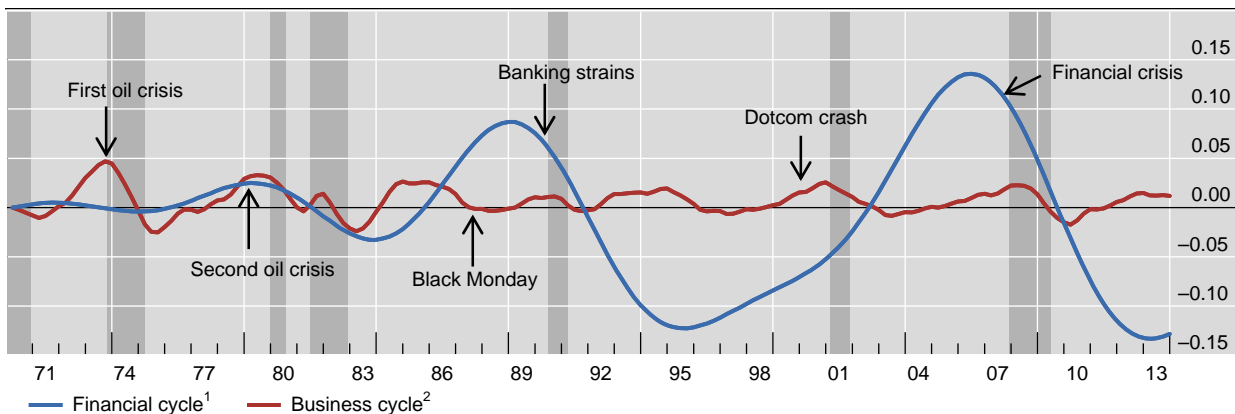
Graph 1 shows the length of the US financial cycle and its coincidence with episodes of distress.⁹ A key point to note is that the length and duration of financial cycles have increased over time and in amplitude.

Financial cycles change with the macroeconomic environment and policy frameworks. They have grown in length and amplitude in the past few decades, reflecting liberalised financial systems and a relatively prolonged period of stable macroeconomic environment and monetary policy framework. The regulatory changes and macroprudential policy frameworks emerging in the period after the financial crisis could similarly affect the dynamics of the financial cycles in the future. A key inference from the analysis is that policy interventions that focus on business cycles may result in potentially serious financial dislocation over the medium term, as the build-up of financial imbalances continues unchecked while policy corrections attempt to address short-term macroeconomic conditions. Complacency about the financial system is further underscored by the so-called "paradox of financial stability", that the financial conditions appear most benign just before the onset of a major crisis.

⁷ Two main approaches exist to measure financial cycles BIS ((2014)). The first one, based on inflection point analysis, assigns peaks and troughs in the cycle to moments when the growth rate of several variables changes direction. Economic production, consumption and unemployment are commonly used variables to identify economic cycles based on this methodology. Turnarounds in real credit growth, credit-to-GDP, and real house prices have been identified as correctly depicting turns in the financial cycle. The second approach relies on statistical filtering of economic or financial series, at the appropriate frequency.

⁸ See Borio (2012) for an extensive discussion of financial cycles and macroeconomics.

⁹ Similar results were obtained for a large range of countries (see 84th BIS Annual Report (2014), pp 65-67).



¹ The financial cycle as measured by frequency-based (bandpass) filters capturing medium-term cycles in real credit, the credit-to-GDP ratio and real house prices. ² The business cycle as measured by a frequency-based (bandpass) filter capturing fluctuations in real GDP over a period from one to eight years.

Source: M Drehmann, C Borio and K Tsatsaronis (2012) and 84th BIS Annual Report (2014).

In view of the foregoing, it is more important for policy makers to focus on the medium-term financial cycles whose peaks tend to coincide with the financial crisis or severe financial and macroeconomic disruptions (Drehmann, Borio, Tsatsaronis (2012), Hakkarainen (2015)). One could complement this with traditional output gap estimates enhanced with proxies for the financial cycle (Borio, Disyatat and Juselius (2014)).

Developing an effective macroprudential policy framework therefore requires identifying and monitoring the sources of system-wide financial risks in terms of their locus on the financial cycle and the amplitude of the cycle. The indicators that capture the financial cycle as well as their limitations are discussed in the next section.

3. Measuring systemic risk

Prudential regulations, the so called “microprudential approach”, tend to target individual institutions or components of the system on a standalone basis, regardless of the institution’s impact on the financial system as a whole. Moreover, they tend to apply the standards uniformly across all institutions in the financial system irrespective of the conditions prevailing at any given point in time. In effect, the microprudential approach assumes that the sources of risk are exogenous and independent of the collective impact of the interactions between individual institutions. Moreover, prudential guidelines often apply to regulated entities and do not cover a large number of financial entities in the systems. By contrast, macroprudential policy aims to address the drawbacks of the microprudential approach by focusing on the system as a whole. In other words, a macroprudential policy framework would simultaneously look at the “cross-sectional” as well as the “time-dimension” aspects of systemic risks in the financial system.

In order to do so, two broad categories of indicators need to be distinguished: “time dimension” indicators, which measure how systemic risk builds up over time in

a financial cycle, and “cross-section” indicators, which measure the concentration of risks in the financial system and in the systemically important institutions (Borio and Drehmann (2009)).

Capturing various dimensions of systemic risk

In the literature of financial stability analysis, a number of indicators have been developed, ranging from traditional balance sheet variables, market-based indicators, broad macro aggregates as well as qualitative information available to supervisory and regulatory authorities. Some of these indicators gauge the resilience of individual players of the financial system, others are focused on system vulnerabilities. A classification and examples are provided in Table 1.

Capturing the financial cycle: some useful indicators

Table 1

Macroeconomic indicators	Broad credit aggregates Measures of debt sustainability (debt to income, debt service ratio)
Banking sector indicators	Stress tests, bank risk metrics Leverage ratios Maturity and currency mismatch Indicators of funding vulnerabilities Profits and losses
Market-based indicators	Asset valuations in equity and property markets Corporate bond and CDS spreads and risk premia Margins and haircuts Lending spreads
Qualitative information	Underwriting standards Asset quality Credit conditions

Source: CGFS Papers No 48 (2012)

Measures of the resilience of banks or other financial sector intermediaries would include capital and liquidity positions, asset quality, profitability, and resilience in response to stress tests. Most of the so-called “Financial Soundness Indicators” listed by the IMF fall in this category of balance sheet indicators. Asset prices, spreads or market liquidity measures (bid-ask spreads or turnover) can give a sense of market resilience. Measures of common exposures (reflected in asset prices or credit developments) can help identify system-wide vulnerabilities and risks that can arise even when even individual institutions are sound on their own. Systemic vulnerabilities can also be detected by using macro stress tests.¹⁰

Clearly these measures can be used as input to a richer analysis of vulnerabilities. Yet most of them have drawbacks. In the first instance they are contemporaneous measures which do not necessarily reflect the nature of the financial cycle dynamics.

¹⁰ For the limitations of macro stress tests (in particular with respect to capturing non-linearities, the assumptions regarding the initial state and the size of the shock), see Borio et al (2012) and Borio (2015).

Second, they are often aggregates of individual institutional information that do not necessarily indicate the common exposures that are embedded in the system. Market-based indicators which include volatilities and spreads are proxies to indicators of financial distress. However, evidence suggests that the lead time of these variables tend to be too short for effective policy interventions.

Desirable properties of indicators

In addition to correctly capturing institution-, market-specific or systemic vulnerabilities, indicators need to have some additional properties that can help to determine the application or withdrawal of macroprudential tools. Good vulnerability indicators should identify a high proportion of crises that occur, while producing a limited amount of “false alarms”. There is a vast literature on early warning indicators for predicting banking crises over short horizons (eg Hutchinson and McDill (1999), Kaminski et al (1999), Bell and Pain (2000), Demirgüç-Kunt and Detragiache (2005), Davis and Karim (2008), Dell’Ariccia et al (2008) and Von Hagen and Ho (2007)), as well as currency crises (Kaminsky and Reinhart (1999)). Over medium- and long-term horizons, credit quantities, debt service ratios and asset prices have been identified as good predictors of financial distress, ((Borio and Drehmann (2009), Gerdesmeier et al (2009), Alessi and Detken (2009), Fornari and Lemke (2009), Borge et al (2009), Drehmann and Juselius (2013)).

These studies suggest that although early warning indicators are useful statistically rigorous measures that are explicitly forward-looking, not all are equally good predictors of financial distress. Among these, the credit-to-GDP gap, defined as the difference between the credit-to-GDP ratio and its long-term trend is seen as more effective than many others in identifying signs of banking distress. This measure was elaborated by Borio and Lowe (2002) and has been subsequently confirmed for a broad range of countries over a long time span (Drehmann and Tsatsaronis (2014)). Other variables such as credit spreads, risk premia and default rates provide complementary information on the levels of stress and risks in the system.

However, a major difficulty is that while several indicators do consistently move in the same directions as the build-up of financial distress they do not reach their peak levels when the crisis hits. In other words there are leads and lags such that effective monitoring of the risks of financial distress may not occur in real time to guide the deployment of macroprudential tools. While the credit-to-GDP gap is a very useful leading indicator it continues to rise for some quarters even after the onset of a crisis. Likewise, the price-to-rent gap or residential property price gap tend to peak four to eight quarters prior to the crisis (CGFS (2012)). Policy makers have to make judgement calls in interpreting the signs. Some reading of tea leaves may be required.

A further complication pertains to the identification of crisis periods, depending on when the analysis starts and finishes. A challenge, faced especially by emerging market economies, is that financial innovation, which results in fast-growing financial sectors or activities (such as securitisation, mortgage lending or consumer credit) comes with incomplete default histories.

Aggregation of data is another major issue. The quality and definition of data relating to specific sectors or time periods can differ. Therefore the indicator thresholds signalling the activation of macroprudential tools should be chosen with

care in a cross-country context. Moreover, aggregating several indicators into a single composite measure of financial stability is a difficult task given the complex nature of the financial system and the existence of complex links between various sectors (Gadanecz and Jayaram (2009)).

Lastly, there are data gaps in the measurement of financial vulnerabilities at domestic and international levels. The Financial Stability Board, jointly with the G20 and the BIS, is currently working on improving data availability and reporting in areas where data gaps have been identified (FSB (2015)): maturity/liquidity mismatches and leverage for both the banking and shadow banking systems; banks' common exposures to and funding received from key markets, sectors and instruments, the principal bilateral exposures and funding patterns of large systematically important banks; sectoral balance sheets; credit default swaps, over the counter derivatives and structured complex products. Work is also underway to develop a unique system of legal entity identifiers at an international level, in order to improve risk management in firms, better assess of micro and macroprudential risks, facilitate orderly resolution, contain market abuse and curb financial fraud, and enable higher quality and accuracy of financial data overall.

4. Choice of macroprudential policy tools

The choice of macroprudential tools depends on the type of imbalances and shocks. That puts a premium on an appropriate set of indicators to guide the deployment and release of macroprudential measures as discussed above.

Some tools can be used to remedy financial imbalances that are domestic in nature. Counter-cyclical provisions, capital and liquidity buffers, and balance sheet instruments (eg leverage ratios, limits on debt service and loan-to-value ratios) applied to banks would fall into this category. They are intended to address threats to financial stability arising from excessive credit expansion and asset price booms, and limit amplification mechanisms of risks through leverage. Margining and haircut requirements are meant to achieve similar outcomes on financial markets. Table 2 provides an overview of such domestic instruments and the associated indicators.¹¹

Other policy tools can help mitigate vulnerabilities arising from the influence of global factors on domestic economy. A number of commodity exporting countries experienced nominal currency appreciation pressures between 2008 and 2013 due to rising commodity prices. Turner (2015) notes that such appreciation pressures can stimulate the credit supply through a number of channels in the economies affected. First, domestic bank lending can be boosted due to a rise in real income, lower credit risk and lower values of debt denominated in foreign currency. Second, the country's risk premium can decline and the higher real value of expected future exports can serve as additional collateral to attract more foreign lending into the country. Third, if the central bank resists currency appreciation by purchasing foreign exchange as capital inflows increase, domestic bank reserves will usually rise unless the central

¹¹ For a survey of individual countries' choice and use of macroprudential tools, see IMF (2011).

bank fully sterilises the purchases by selling bonds.¹² Lastly, real currency appreciation in a commodities boom context may increase gross fixed capital formation and reinforce the impact of credit expansion.

Policy instruments and potential indicators

Table 2

Policy instrument	Potential indicators
Capital-based instruments	
Countercyclical capital buffers ¹	Measures of the aggregate credit cycle
Dynamic provisions ¹	Bank-specific credit growth and specific provisions (current and historical average)
Sectoral capital requirements	Measures of the price and quantity of different credit aggregates (stock and new loans) on a sectoral basis: interbank credit, OFIs, non-financial corporate sector and households Measures of sectoral concentrations Distribution of borrowing within and across sectors Real estate prices (commercial and residential, old and newly developed properties) Price-to-rent ratios
Liquidity-based instruments	
Countercyclical liquidity requirements	LCR and NSFR Liquid assets to total assets or short-term liabilities Loans and other long-term assets to long-term funding Loan-to-deposit ratios Libor-OIS spreads Lending spreads
Margins and haircuts in markets	Margins and haircuts Bid-ask spreads Liquidity premia Shadow banking leverage and valuation Market depth measures
Asset-side instruments	
LTVs and DTIs	Real estate prices (commercial and residential, old and newly developed properties) Price-to-rent ratios Mortgage credit growth Underwriting standards Indicators related to household vulnerabilities Indicators of cash-out refinancing

¹ To steer the application of countercyclical capital buffers and dynamic provisions, a range of indicators is useful. However, the table only shows the indicators which have been officially proposed or implemented (for countercyclical capital buffers, see Basel Committee (2010b); for dynamic provisions, see Saurina (2009)).

Source: CGFS Papers No 48 (2012)

¹² The effects on the banking system balance sheet and bank lending may be non-trivial even in case of full sterilisation; see Gadanecz, Mehrotra and Mohanty (2014).

Monetary authorities have tried to mitigate the expansionary effects of commodity cycles and capital inflows by resorting to macroprudential measures. For instance, Bruno and Shin (2013) argue that in Korea macroprudential measures targeted to non-core deposits have reduced the sensitivity of capital inflows to global factors, relative to a group of comparator countries. As noted in Turner (2012), Indian authorities have used restrictions on non-resident flows into their domestic long-term securities markets for similar reasons.

At the domestic or international level, spillovers and systemic risks stemming from the systemic relevance and interconnectedness of banks and other financial institutions may be addressed through capital surcharges (additional loss absorbing capacity) for larger institutions. Size-dependent leverage limits or asset risk weights, limits on single exposures, as well as a monitoring of market concentration and common exposures can also be deployed. Lastly, the Financial Stability Board (FSB) is coordinating work on a specific resolution framework for SIFIs.

Measures to enhance the robustness of market infrastructures (settlement of OTC derivatives, central counterparties, Legal Identity Identifier project) are key complements to the instruments discussed.

Should policymakers rely on a single tool or on multiple instruments? Should macroprudential policies relate to specific sectors, institutions or instruments, or should they be applied across the board, for instance to all banking activities? As argued in Turner (2012), the use of a suite instruments as opposed to a single tool may be less distortionary, more precise and more effective. That being said, a greater number of instruments could make calibration harder (particularly if there is lack of historical data between instruments). In addition, deploying a large number of instruments may inadvertently result in overregulation.

5. Policy interventions: settings and timing

How should policymakers apply macroprudential instruments? Should the application be rules-based or discretionary? Should the settings be fixed or adjustable according to developments in systemic risk?

A rules-based approach has the benefit of being transparent and easy to communicate.¹³ However, it can be difficult to calibrate, and suffer from the Lucas critique (meaning that the structural set-up can change as a result of the policy being in place, invalidating previous model calibrations). That would argue for a more discretionary approach (CGFS (2012)). For instance, when decisions were made in Sweden and Australia as to whether or not macroprudential measures should be deployed, signals given by standard housing market indicators such as house price indices or price-to-rent gaps have been overruled by regulatory judgment or market specificities (such as controlled rents).

While a number of countries have used fixed (absolute) limits on risk-taking during boom phases, in the form of loan-to-value ratios, limits on debt service ratios or currency mismatches, these fixed measures may have the disadvantage that they

¹³ On the risks of setting and communicating overly ambitious objectives, see Borio (2015).

exert their effects differently during various phases of the cycle. Thus, the use of adjustable instruments, such as procyclical capital requirements for trading books, and margin requirements based on through-the-cycle valuations of collateral assets, has gained traction internationally (BIS (2010)).

It is important to get the timing of policy actions correct, as the costs mis-timed policy action (or policy inaction) can be significant.¹⁴ The costs of a mis-timed activation of macroprudential tools are asymmetric. Delayed action is generally more costly than premature intervention (CGFS (2012)). Delayed activation can mean less effective or ineffective intervention (as measures take time to gain traction). It can even initiate a disorderly unwinding of imbalances. On the other hand, implementing measures too early means unnecessary regulatory costs, and it may weaken the impact of the instrument. Withdrawing too late may amplify procyclical effects. Deactivating too early may give market participants the wrong signal (and thus create moral hazard).

Just like the choice of instruments, the timing of their activation and withdrawal may rest on domestic as well as international considerations, based on the financial and real linkages of the domestic economy with the rest of the world. The case of Switzerland, for instance, where one major bank required government support during the global financial crisis, illustrates the importance of international factors from this perspective. Although domestic indicators accurately identified no domestic vulnerabilities for the bank, its vulnerabilities stemmed from its cross-border exposures (CGFS (2012)).

For all intents and purposes, policymakers can rely on forecasting models and indicators to determine the timing for the application and deactivation of macroprudential measures. In that exercise it is important to capture the interactions between systemic risk, market dynamics and policy choices, taking account of spillovers and second-round effects. This is also an area of policy where theoretical and empirical models can still be developed further.

6. Macroprudential policy and monetary policy

How do macroprudential instruments relate to traditional monetary policy tools? One view is that macroprudential policy might completely substitute for policy interest rate moves in stabilising the economy, insofar as the transmission channels are similar (Cecchetti and Kohler (2012)).¹⁵ Indeed, as noted by Shin (2015) and in BIS (2015), both sets of policies affect the demand for credit (by influencing the timing of consumers' spending decisions) and the financing supply (by impacting banks' funding choices and leverage situation). Another view is that macroprudential tools cannot replace policy rate adjustments (Stein (2013)), because interest rates are the universal price of leverage which apply to all agents in the economy and present virtually no scope for regulatory arbitrage.

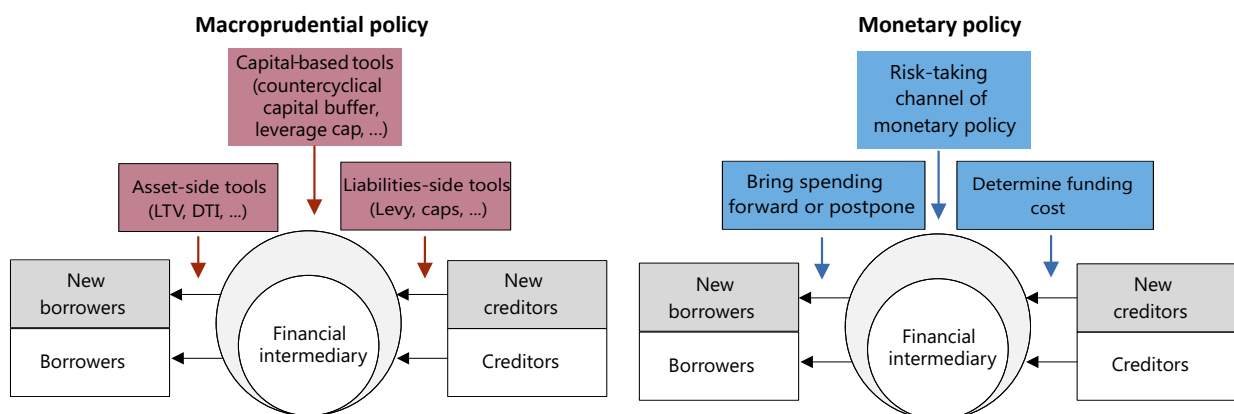
¹⁴ In practical terms, this may require a correct identification of the phase of the financial cycle: see discussion in Section 2.

¹⁵ Changes in policy rates or in capital requirements both alter banks' cost of doing business.

The recent literature has come to consider macroprudential and monetary policies as complementary (see Graph 2), for two reasons. First, the policy interest rate alone may be too blunt a tool to address financial stability risks, which often have a sectoral dimension. While interest rates apply uniformly to all parts of the economy and the financial system, macroprudential policies can be tailored to specific sectors, regions, institutions, products or practices. Targeted macroprudential measures can thus usefully complement monetary policy. Second, financial booms may simply be too powerful to be addressed with one type of policy: considering macroprudential and monetary policies as complementary can make it easier to jointly pursue the objectives of price stability, output stability and financial stability (Borio (2014b), Shin (2013)). For instance, macroprudential tools can be deployed to balance the effects of an overly loose monetary policy, although tensions and contradicting incentives may be created when the two sets of policies are pulling in opposite directions (Shin (2015)).

Macroprudential tools and monetary policy are inter-related

Graph 2



LTV = loan-to-value; DTI = debt-to-income.

Source: Shin (2015) and 85th BIS Annual Report (2015).

7. Macroprudential instruments: measuring effectiveness in the short- and medium term

In order to gauge the effectiveness and efficiency of macroprudential measures, the following questions can be asked, as outlined in CGFS (2012): (i) Is there a robust link between changes in the instrument and the stated policy objective? For instance, do the measures impact banks' total credit stock, or only their new lending? Do the effects of the measures increase in a linear fashion as the intensity of the measures increases? (ii) What is the effect on expectations? For example, to what extent and how do players adapt their expectations in response to macroprudential measures by enhancing risk management practices or cutting their exposures to certain risks? (iii) What is the scope for regulatory arbitrage, whereby certain risky activities targeted by the measures are still pursued, but outside the scope of the regulatory umbrella? (iv) How quickly can the measures be implemented from a legal, operational and

practical perspective? (v) What are the costs of the measures, especially in terms of loss of output and foregone credit expansion?

In practical terms, an assessment must compare two outcomes:

- on the one hand (scenario where no macroprudential measures are taken), the economic and financial fallout on the macroeconomy from the occurrence of a crisis, weighted by the probability of a crisis occurring;
- on the other hand (in case measures are taken), the certain up-front costs of the measures plus the costs of the crisis attenuated by the measures, weighted by the probability of occurrence of the crisis. The question arises whether the probability or timing of a crisis can be known with certainty or whether it has changed compared the previous scenario under the hypothesis that macroprudential measures have been applied.

A number of studies by Basel-based groups make an attempt at quantifying the effects in terms of lower crisis probabilities versus output costs (BCBS LEI (2010a), MAG (2010)). In 2011 the FSB has issued a progress report on the implementation of macroprudential policy tools in G20 and other countries, focusing on the identification of systemic financial risk, the designation and calibration of macroprudential instruments, and the relevant institutional and governance arrangements at national and regional levels.

In addition, a number of recent research papers have assessed macroprudential policy outcomes. Kuttner and Shim (2013) study the effects of macroprudential policies on housing credit and house prices, looking at a large cross-country sample for the period 1980-2011. They show that certain types of targeted credit or tax policies may be used to enhance financial and macroeconomic stability. Debt service to income and loan to value ratios as well as exposure limits and housing taxes appear to influence housing credit extension in the desired direction. Instruments affecting the supply of credit by increasing the cost of providing housing loans (risk weights, liquidity requirements) or restricting their quantities (credit limits) have little or no effect on the housing market. Loan to value and debt service ratios are also found to affect the demand for housing loans in the desired way.

Borio (2015) notes that macroprudential policies are often more successful in strengthening resilience than in constraining booms, and that the effectiveness varies among tools. Capital requirements are often less effective than loan-to-value or debt-to-income ratios, or restrictions on wholesale funding. But all macroprudential tools can be subject to regulatory arbitrage. Another question is whether the effects of macroprudential measures differ according to where one finds oneself in the economic and financial cycle when they are applied. And, are the effects of macroprudential tightening and loosening asymmetric? In a study of the housing market for the period 1990–2013 for 17 economies, McDonald (2015) finds that tightening measures are more effective in restraining booms when credit is expanding rapidly compared to other points in the cycle, and that tightening measures have a stronger impact than loosening ones. These results, though, would need to be qualified by whether fixed or adjustable macroprudential measures have been deployed (see discussion in previous section).

Macroprudential tools are mostly focused on banks. Given the size and scope of non-banking activities, it is well known that leveraged players and activities (eg shadow banking) create systemic risk. Moreover, the asset management industry (eg

hedge funds) can and do amplify market disruptions. The ability of macroprudential policy tools in addressing these risks is insufficiently understood (Borio (2015)).

While the policy instruments were largely designed to deal with private sector excesses, the public sector can be a source of risk. Sovereign risks are especially hard to address because of political economy aspects involved and the fundamental macroeconomic nexus that is involved. For instance, it may be politically hard to justify macroprudential measures that lean against the wind in a boom phase, given the certain short-term costs and uncertain medium to long-term benefits. That puts a premium on governance arrangements (covering autonomy, competency and know-how) between the central bank, the government and various micro- or macroprudential authorities. Macroprudential policies also need support from other (eg fiscal¹⁶ and structural) policies.

Regarding the international aspects of macroprudential policymaking, Borio (2015) points out that the international co-ordination of policies is an area where further work is required, given the scope for international arbitrage, the nature of international financial conglomerates spanning multiple jurisdictions and the prevalence of financial intermediaries' cross-border funding and other exposures.

There exists a rich literature assessing the effectiveness of capital flow management measures for macroprudential purposes. Such measures have been resorted to in the past decade to attenuate the impact of global financial conditions on emerging market economies. Some studies find that this approach has been effective. In a comparative assessment of the effectiveness of macroprudential policies in 12 Asia-Pacific economies for the period 2004-2013, Bruno and Shin (2013) find that capital flow management measures applied to banking and bond markets have been effective in slowing down banking and bond inflows, respectively.

The evidence reported in other studies on the effectiveness of capital flow management measures for macroprudential purposes is more mixed. Habermeyer et al (2011) find that macroprudential measures introduced in 13 EMEs succeeded in mitigating the impact of capital inflows¹⁷ in some cases, reduced credit growth in others, but failed to restrain asset price inflation. Such measures also do little to remedy maturity and currency mismatches on the liability side of balance sheets. Kuttner and Shim (2013) report that certain types of targeted credit and tax policies can affect the housing market, and could potentially be used as tools to promote financial and macroeconomic stability. However, not all policies are able to achieve this outcome. In particular, policies designed to affect either the supply of or the demand for credit do not have a discernible impact on house prices, and the authors also caution that their findings are sensitive to the choice of econometric approach.

¹⁶ The rise in sovereign risk as a result of bank bailouts in the aftermath of the Great Financial crisis is one illustration of the burden placed on public finances in this context (Borio (2015)).

¹⁷ The objectives of capital flow management noted by the authors include stemming currency appreciation, reducing the volume of capital inflows, changing their composition, providing greater room for monetary policy maneuver, slowing credit growth, and dampening asset price inflation.

8. Combining micro- and macro-level data for macroprudential analysis and policymaking

Macroprudential analysis and policymaking relies on a combination of micro- and macro-level data. That is because gauging vulnerabilities in the system as a whole also involves getting a bird's eye view of individual market players (at least the systemically most important ones) and their interlinkages (Dombret (2012)). For instance, macro stress tests are only comprehensive if, in addition to system-wide metrics, they also incorporate firm-specific balance sheet data, in order to get a sense of interconnections and the potential contagion of shocks. Bank-specific data on capital adequacy, funding and asset quality is often needed to draw a systemic risk map, in order to detect vulnerabilities at systemic institutions that might propagate through the system (Constâncio (2012)).

More generally, the analysis of financial cycles and in particular credit booms shows that these can often be a prelude to financial crisis. The objective of macroprudential policy is then precisely to obtain a systemic perspective of the boom conditions with a view to moderating the credit cycles. On the one hand, macro aggregates are necessary to analyse the systematic patterns in the expansionary phase of booms, such as rising asset prices, economic expansion, widening external deficits, exchange rate volatilities or other conditions of macro fragility. On the other hand, micro data are able to show a strong association between credit booms and firm-level measures of leverage, its external financing conditions, firm value and indicators of banking fragility (Mendoza and Torres (2008)).

Integrating macro and micro data would help in designing quantitative models that can further our understanding of how conditions affecting individual borrowers (demand for credit) could produce strong financial amplification. Moreover, the analysis would also help gauge how effective prudential policies might be in influencing private borrowing incentives in a desirable manner (Bianchi and Mendoza (2015)).

9. Conclusion

Macroprudential measures serve two main purposes: enhance system resilience and attenuate cycles. They are distinct from day-to-day risk management, crisis management, crisis resolution, and capital flow management measures. They are complementary to monetary policy. This paper has reviewed the appropriate set of indicators that policymakers can rely on when deploying macroprudential tools, depending on the type of vulnerability and the desired policy objective. Work is currently being done to close some data gaps that may limit the availability of a comprehensive set of indicators to guide policymaking.

Rules-based and discretionary approaches for activating and deactivating macroprudential policy tools both have advantages and drawbacks. As timing errors relating to both the activation and deactivation can entail significant costs, identifying the stage and amplitude of the financial cycle is important. More work is required to model the characteristics of the financial cycle to get a better understanding of its empirical properties. Capturing the interactions between systemic risk, market

dynamics and policy choices, as well as spillovers and second-round effects, is an area of policy where theoretical and empirical models can still be developed further.

The literature on assessing the costs and benefits of macroprudential measures is young, but growing. Gauging the efficacy of macroprudential policy measures is a multidimensional exercise, taking into account the link between policy outcomes and objectives, effects on expectations, scope for arbitrage and costs. In the main, one has to make a comparison of the costs of two scenarios, weighted by their respective probabilities: occurrence of a crisis under no policy action, versus economic and financial outcomes under policy action.

Yet another issue relates to the diverse nature of macroprudential objectives and instruments. There is no one-size-fits-all approach and which tools to use, how to calibrate them and when to deploy them depends on how the policymaker views the build-up of vulnerabilities. The interaction with fiscal and monetary policy should be better understood while attempting a broader operational framework for financial stability (Borio (2014a), Borio (2014b), Caruana (2014)).

When it comes the use of the indicators, this paper has reviewed the various sets of indicators: balance sheet indicators as well as market-based ones. Many studies have emphasised the need for leading or forward-looking indicators rather than measures that reflect the contemporaneous situation. While both the “cross-section” and “time” dimensions of risks need equal attention, post-crisis policy has to some extent addressed both. These distinct dimensions call for more precise calibration of tools based on the analysis of vulnerabilities, which in turn require more precise indicators. However, of the two, the time dimension presents additional challenges, as macroprudential intersects with macroeconomic policy.

Lastly, the integration of macro aggregates with micro data on firm and household behaviour as well banking sector indicators could help to better calibrate the macroprudential tools as well as to understand their effectiveness.

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IFC workshop on *"Combining micro and macro statistical data for financial stability analysis. Experiences, opportunities and challenges"*

Warsaw, Poland, 14-15 December 2015

Macroprudential policy frameworks, instruments and indicators: a review¹

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¹ This presentation was prepared for the meeting. The views expressed are those of the author and do not necessarily reflect the views of the BIS or the central banks and other institutions represented at the meeting.



BANK FOR INTERNATIONAL SETTLEMENTS

Macroprudential frameworks, instruments and indicators : a review

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IFC-NBP Workshop

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Outline of the presentation

- What are macroprudential frameworks?
- Financial cycles : key characteristics
- Systemic risk – dimensions and measurement
- Macroprudential indicators: role and limitations
- Using macroprudential tools
 - When and how?
 - Interaction with monetary policy
 - Measuring effectiveness
- Conclusion



Macroprudential frameworks: three defining features (FSB-BIS-IMF reports for the G20)

- Goals
 - Limit systemic risk – risk of crises / widespread disruptions to financial services with serious costs for the real economy
 - Enhance financial system resilience
- Scope
 - Focus on the financial system as a whole, not individual institutions
 - Aimed at specific sectors, specific risks and practices
- Instruments and governance
 - (Primarily) prudential tools calibrated to target specifically systemic risk

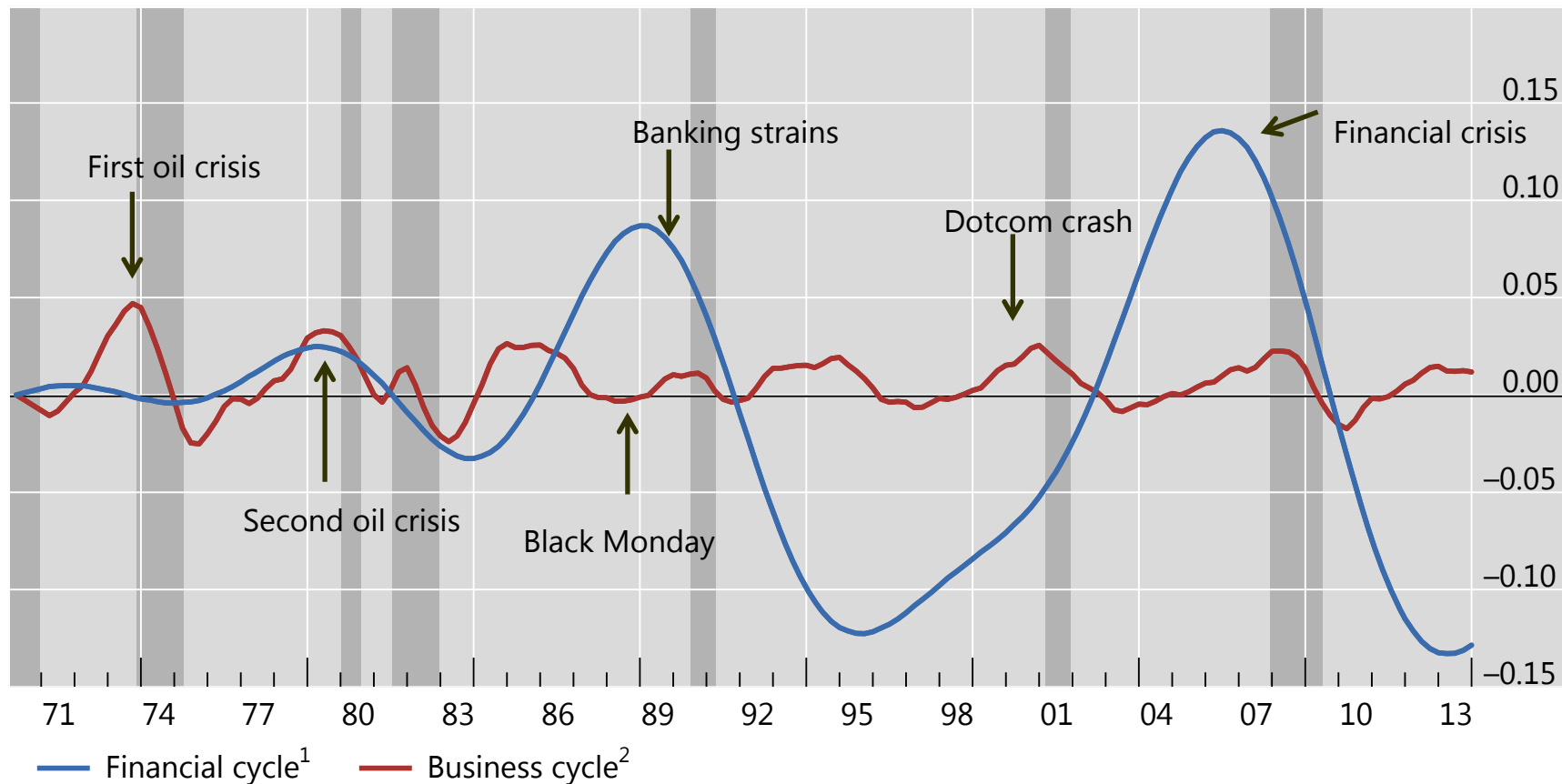


Financial cycles: role and characteristics

- Understanding the characteristics of the FC is key to measure the build-up financial instability conditions
- Four characteristics of financial cycles
 1. Financial cycles are much longer than business cycles
 2. Peaks in the financial cycles coincide with serious financial distress
 3. Often synchronised across economies
 4. FC helps to identify FD risks in real time with good lead (2-4 years)
- Financial cycles change with macroeconomic and policy environment
- FC has implications for design and limitations of macroprudential frameworks



The financial cycle is longer than the business cycle (the US example)



¹ The financial cycle as measured by frequency-based (bandpass) filters capturing medium-term cycles in real credit, the credit-to-GDP ratio and real house prices. ² The business cycle as measured by a frequency-based (bandpass) filter capturing fluctuations in real GDP over a period from one to eight years.

Source: from Drehmann et al (2012), updated.

Systemic risk – dimensions and measurement

- Whole is more than a sum of its parts
 - Systemic risks (mostly) exogenous to institutions but endogenous to the system
- Time dimension
 - How systemic risk evolves over time
 - Self-reinforcing feedbacks between financial system and the real economy (procyclicality)
- Cross-sectional dimension
 - How risk is distributed within the financial system at any given time: common exposures, interlinkages, contagion
 - Impact of the failure of an institution on the system as a whole (TBTF).



Macroprudential indicators – uses and limitations

- Macroeconomic indicators
 - Broad credit aggregates (credit-to-GDP gap)
 - Measures of debt sustainability (debt to income, debt service ratio)
- Banking sector indicators
 - Leverage ratios and funding vulnerabilities
 - Maturity and currency mismatches
 - Stress tests, VaRs, risk metrics
- Market-based indicators
 - Asset valuations and prices (equity and property markets)
 - Risk premia: CDS spreads, bond spreads
- Qualitative indicators
 - Underwriting standards, asset quality, credit conditions



Macroprudential instruments

- Capital-based instruments
 - Countercyclical capital buffers
 - Dynamic provisions
 - Sectoral capital requirements
- Liquidity-based instruments
 - Countercyclical liquidity requirements
 - Margins and haircuts
- Asset-side instruments
 - Loan-to-value ratios
 - Debt-to-income ratios
- Data needed for analysis must integrate micro data in a macro framework



Policy interventions: settings and timings

- Applying the policy: rules-based versus discretionary
- When to intervene
 - Context: initial conditions are usually good (peak of the FC)
 - Lags between build-up of risks and materialisation can be very long.
 - Timing of intervention is a major issue
- Political economy context – difficult to communicate leaning against the wind
- Mis-timed withdrawal has costs, too:
 - Too early can be ineffective
 - Too late has financial and macroeconomic costs



Macroprudential and monetary policy

- Possible substitutes?
 - Similar transmission channels: both impact the cost of doing business.
 - Affect demand for credit (consumer/household incentives)
 - And the supply of credit (banks' funding choices, leverage and costs)
- Increasingly seen as complementary
 - Interest rate too blunt for sectoral allocations
 - Together support multiple objectives: price stability, output growth and financial stability
- More effective in working in the same direction (although need to mitigate in some cases)
- Less effective when pulling in the opposite direction (conflicting incentives)



Macroprudential policy - effectiveness

- More effective in strengthening resilience than in constraining booms
 - Effectiveness varies across tools
 - Limited: capital (total, risk-weights, etc); provisions
 - Greater: debt-to-income ratios; LTVs; restrictions on wholesale FX funding
 - But all vulnerable to regulatory arbitrage
- Context: political economy (inaction bias)
- This puts a premium on
 - Governance arrangements: independence (cum accountability) and know-how
 - Balance rules vs discretion



Summing up

- Clear need to combine micro- and macro-level data for macroprudential analysis and policymaking
- More work required to:
 - Model the characteristics of the financial cycle
 - Develop better theoretical and empirical models to capture interactions between:
 - Systemic risk and market dynamics
 - Changing patterns of financial intermediation
 - Global financial cycles and spillovers
- Interaction with monetary, fiscal and other prudential policies

